NUTRITIONAL ASSESSMENT OF CHILDREN LESS THAN 2 YEARS OF AGE ADMITTED WITH DIARRHEA IN A TERTIARY CARE HOSPITAL OF PESHAWAR, KHYBER PAKHTUNKHWA

Muhammad Waseem Shah,[a] Huma Naqeeb[b]

ABSTRACT

Introduction: The prevalence of diarrheal diseases differs greatly with the seasons and child's age having highest incidence during infancy which declines as a child grows older. Diarrhea entails serious nutritional demands on infants and small children. The present study was conducted to assess the actual dietary intakes and nutrition status of children less than 2 years old with diarrhea, using different techniques.

Materials & Methods: It was a hospital based study conducted in Nutritional Rehabilitation Unit (NRU) of Hayatabad Medical Complex Peshawar from August 2011 to November 2011. Children with diarrhea less than two years of age were enrolled and a questionnaire was used for data collection from subject's mother or attendants. 24 dietary recall method was used for child's actual diet intakes. SPSS version 16.0 was used for data analysis.

Results: Majority of parents (38% fathers & 82% mothers) were illiterate and belonged to rural areas, where the people are not aware of recommended dietary needs and safety protocols. The mean protein intake was 6.06 ± 7.1 g/day for male patients and 14.64 ± 8.71 g/day for female patients. The mean caloric intake of male children was 252.15 ± 247.63 kcal/day and for female was 574.58 ± 259.28 kcal/day.

Conclusion: Parental education, poor breastfeeding practices, poor hygiene and sanitation practices in our society may lead to diarrhea and malnutrition in children less than 2 year of age.

Key words: Nutritional Assessment; Child Malnutrition; Diarrhea; Hygiene; Water Quality.

Author Designation & Affiliation
a. Research Officer, Department of Medical Research, Rehman Medical College Peshawar
b. Senior Dietitian, Rehman Medical Institute, Peshawar

INTRODUCTION

Diarrheal diseases are a leading cause of morbidity and mortality among young children in low income countries. Causes of diarrhea in endemic areas include a wide variety of bacteria, viruses and protozoa.[1] Diarrhea accounts for 18% of all the global infant deaths annually among children <5 years of age.[2] Under-nutrition accounts for 35% of all deaths among under five year old children and more than 2 million children die each year due to under nutrition; the three main indicators used to define under nutrition are stunting, underweight and wasting.[3] The younger the child, the greater the risk that fluid and electrolyte losses will lead to dehydration. Fluid losses resulting from diarrhea and vomiting can be as high as three times the circulating blood volume (80-125-250 mL/kg bodyweight/day).[4]

This important public health problem is connected to water and sanitation and can be both "waterborne" and "water-washed". A consensus developed that the key factors for the prevention of diarrhea are sanitation, personal hygiene, availability of water and good quality drinking water; and that the quantity of water that people have available for hygiene is of equal or greater importance for the prevention of diarrhea as the bacteriological water quality.[5] The risk factors of diarrhea vary with the age of child, the pathogens involved and the local environment.[6] Acute episodes of watery diarrhea are often best managed by oral glucose-electrolyte solutions with continuation of breastfeeding and early reintroduction of feeding. Selective use of lactose-free milk formula, short-term zinc supplementation and antibiotics may be necessary for ill children with poor nutrition, persistent symptoms, or dysentery.[7]

During diarrhea, the patient's dietary intake and absorption of nutrients are reduced while nutritional requirements are increased.[8] This results in dehydration and malabsorption of nutrients which may lead to malnutrition in children. The present study was designed to

determine the nutritional status and document the dietary intakes of children less than 2 years of age with diarrhea admitted in the Nutrition Rehabilitation Unit (NRU) of Hayatabad Medical Complex, Peshawar.

MATERIALS & METHODS

This hospital based study was conducted in Nutritional Rehabilitation Unit (NRU) of Hayatabad Medical Complex Peshawar from 7th August till 7th November 2011. Data of 50 hospitalized children less than 2 years of age suffering from diarrhea were collected, of whom children having other complications were excluded. An indigenously designed Performa was used for recording information after approval from NRU and ethical committee of HMC. Data regarding health and nutritional status were filled with the help of mother or attendant; demographic data, feeding history, medical history and socio-economic conditions were recorded.

The 24 hour diet recall method was used by asking the mothers or attendants to recall the kind of foods and amounts consumed by the children during the last 24 hours. The amounts were estimated in common household measures or servings (cups, glasses and bowls etc.). Daily food intake was recorded after which the calories consumed were compared with target calories.

Different methods were used for nutritional assessment such as Anthropometric assessment, Biochemical assessment, Clinical assessment and Dietary assessment. Anthropometric assessments included weight, height and Occipital Head Circumference (OFC). Weights of infants were taken by using pediatric scale for infants and beam scale for children and were recorded in kilograms. Length board was used for measuring children's length in centimeters after removing heavy dress and shoes of the child. The occipital-frontal circumference was taken with the help of non-stretchable measuring tape. Biochemical assessment was done in which serum electrolytes and hemoglobin levels were compared with normal levels.

For malnourished children the data were entered into the nutritional rehabilitation file in which the daily intake was recorded by 24 hour recall method after which the calories taken were compared with the target calories.

SPSS version 16.0 was used for deriving descriptive statistics, mean and standard deviation of the collected data.

RESULTS

Demographic and socio-economic data of children and their families are shown in Table 1.

Table 1: Demographic and Socio-economic status of children & their families (n=50)

Variables	Frequency (%)
Gender of children	
Female	15(30)
Male	35(70)
Nationality	
Pakistani	39(78)
Afghani	11(22)
Father's Education	
Illiterate	19(38)
Primary	02(04)
5th – 9th	07(14)
Matric	11(22)
F.A	07(14)
B.A	02(04)
Higher	02(04)
Father's Occupation	
Govt. Servant	09(18)
Private Job	33(66)
Unemployed	04(08)
Mother's Education	
Illiterate	41(82)
5th – 9th	04(08)
Matric	01(02)
F.A.	03(06)
B.A.	01(02)
Own House	
No	12(24)
Yes	38(76)
Family Type	
Joint	40(80)
Nuclear	10(20)

Of 50 children, 30.0% (n=15) were female, while 70.0% (n=35) were male. The nationality was

from Pakistan in 78.0% (n=39) while 22.0% (n=11) were from Afghanistan. Regarding paternal education, 38% (n=19) children had uneducated fathers, 4% (n=2) fathers had primary education, 14% (n=7) fathers had education up to class 5 - 9, 22.0% (n=11) were matriculates, 14% (n=7) were educated to F.A. level, 4% (n=2) were B.A., and 4.0% (n=2) had higher education. Illiterate mothers were 82% (n=41). As shown in Table 1, 18% (n=9) of fathers were employed in government jobs, while 66.0% (n=33) were performing jobs in private sectors.

The socio-economic status of hospitalized children revealed that 38% (n=76) families had their own houses, while 24.0% (n=12) were living in hired houses. The family system was of the joint family type in 80% (n=40), with remaining 20% (n=10) families being of the nuclear type.

Table 2 shows immunization history of the patients which indicated that 36% (n=18) had completed their immunization course, 20% (n=10) were in progress while 24% (n=12) had never done immunization. The birth history showed that 92% (n=46) children were born full term while 4% (n=2) children were premature and 4% (n=2) were post mature.

Table 2: Immunization and Birth History (n=50)

Variables		Frequency (%)
Immunization History	Completed	18(36)
	In Progress	10(20)
	Never Done	12(24)
Birth History	Full Term	46(92)
	Premature	02(04)
	Post Mature	02(04)

Table 3 shows the anthropometric data of children. The mean weight at admission of male children was 6.82 ± 2.19kg while that of female children was 6.66 ± 1.54kg.

The weight recorded at the time of discharge of male children was 7.03 ± 2.18kg while that of

female children was 6.82 ± 1.57kg. The mean Mid Upper Arm Circumference (MUAC) of male children was 11.59 ± 1.95cm while that of female children was 11.08 ± 1.62cm. The value of MUAC indicates that all of the children were malnourished.

Table 3: Anthropometric data of children (n=50)

Parameters	Male (n=15) (Mean ± SD)	Female (n=35) (Mean ± SD)
Weight at Admission (kg)	6.82 ± 2.19	6.66 ± 1.54
Length (cm)	70.67 ± 10.31	70.23 ± 6.35
MUAC (cm)	11.59 ± 1.95	11.08 ± 1.62
OFC (cm)	43.09 ± 3.66	43.27 ± 2.49
Weight (kg) on Exit	7.03 ± 2.18	6.82 ± 1.57
MUAC (cm) on Exit	11.66 ± 1.90	11.16 ± 1.62

The mean OFC of male children were recorded as 43.09 ± 3.66cm while that of female children were 43.27 ± 2.49cm.

Table 4 shows biochemical results of children which indicate that males had mean serum sodium levels of 137.5 ± 6.2 mmol/l while that of females was 137.25 ± 6.93 mmol/l. Male children had mean potassium levels of 4.18 ± 0.88mmol/l while that of females was 3.78 ± 0.86 mmol/l. Mean hemoglobin of male children was 9.55 ± 2.0 gm/dl and that of female patients was 8.41 ± 1.47 gm/ dl.

Table 4: Biochemical data of patients (n=50)

Variables	Male (n=15) Mean ± SD	Female (n=35) Mean ± SD
Sodium (Na$^+$)	137.5 ± 6.2	137.25 ± 6.9
Potassium (K$^+$)	4.18 ± 0.88	3.78 ± 0.86
Hb (gm/dl)	9.55 ± 2.0	8.41 ± 1.4

Normal values: sodium (136-150 mmol/l); Potassium (3.5-5.1 mmol/l; Hb males (16-18 gm/dl, females 14-16 gm/dl)

Table 5 shows the current caloric intake of children. The mean of target calories for males

was 252.15 ± 247.63 kcal/day and for females was 574.58 ± 259.28 kcal/day. Mean carbohydrate intake of males was 36.10 ± 32.39 kcal/day while that of females was 72.82 ± 61.89 kcal/day. Similarly mean protein consumption of males was 6.06 ± 7.10 kcal/day while that of females was 14.64 ± 8.71 kcal/day.

Table 5: Dietary intake data of patients

Variables	Males (n=15) (Mean ± SD)	Females (n=35) (Mean ± SD)
Protein (g/day)	6.06 ± 7.10	14.64 ± 8.71
Carbohydrates (g/day)	36.10 ± 32.39	72.82 ± 61.89
Calories (kcal/day)	252.15 ± 247.63	574.58 ± 259.28

DISCUSSION

The main causes of death among children under 5 years of age are acute respiratory infection (17%) and diarrheal disease (16%).[9] Nearly three quarters of child deaths occurs due to diarrhea in just 15 countries in which Pakistan's child mortality rate is 53,300 per year.[10] The present study showed that all 50 children included in the study were malnourished with no gender difference, while another study showed that male children were more at risk.[2]

Parental education, particularly maternal education was poor in the present study, as were other socio-economic indicators. Socio-demographic factors like parents' education, occupation, family income and family size are linked with mothers' knowledge about diarrhea and its management, apart from mothers' personal attitude and behavior.[11]

The immunization status of children was unsatisfactory as only 36% had completed their immunization (Table 2). A study conducted in rural area of Bangladesh showed that severe diarrhea is associated with *Shigella* infection. Such infected children are often malnourished because their poor immune responses cause loss of appetite and consequent inadequate intake, increased catabolism, epithelial damage and loss of nutrients in stools as well as protein losing enteropathy.[12]

Dietary intake data in the present study indicated that male children were getting considerably lesser amounts of Proteins, Carbohydrates and Calories per day as compared to female children (Table 5). Some the studies revealed that children suffering from diarrhea have a lot of complications including dehydration and secondary malnutrition, for which primary therapy consisting of fluid and electrolytes replacements and energy replacements with other nutrients is needed.[13]

A study done on association of weight and length with diarrhea reported that diarrhea has a short term or negative association with weight (confirmed by Velocity and lagged Model) while its association with length was more complex.[14]

A long cross-sectional study done in rural Uganda on children aged 0-23 months found that history of fever was associated with wasting and stunting and was the cause of malnutrition.[15]

Some of the experts believe that sodium concentration should be lowered (44-60 mmol/l) in oral rehydration salt solutions, as increased level can cause heart failure especially in children with edema; also the low concentration of intracellular potassium and water retention reduce myocardial contractility and transportation of ions across cell membrane is affected by this mechanism; if a child is having hemoglobin level ≤4-6 g/dl, there is a need for blood transfusion.[16]

Some of the measures like stunting, wasting and micronutrient deficiencies are used as most common parameters for reflecting acute malnutrition in children under five years of age. Protein malnutrition in a child can result from an unbalanced, protein poor and carbohydrate rich diet, which is commonly found in children born within 18 months of a previous birth.[17]

Conclusions

Parental educational and socio-demographic backgrounds affect the nutritional status and health of children less than two years of age suffering from diarrhea and contribute to occurrence and worsening of diarrhea in this age group.

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Corresponding Author

Muhammad Waseem Shah, Department of Medical Research, Rehman Medical College Peshawar Pakistan.

Email: waseem.shah@rmi.edu.pk